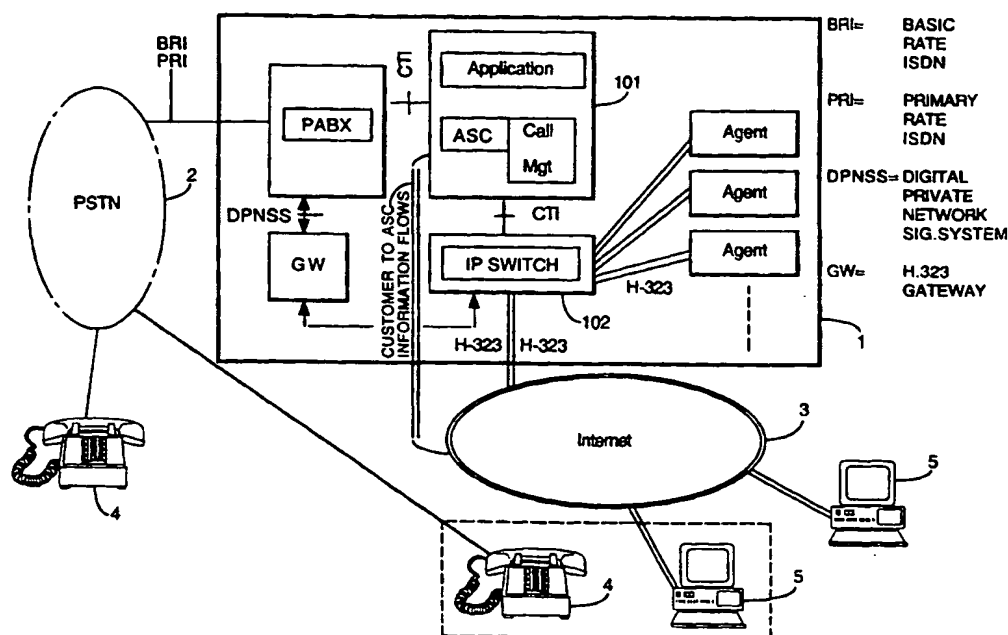




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(54) Title: CALL CENTRE



(57) Abstract

In a call centre connected via a network to a number of terminals, at least part of a process of automatic call distribution (ACD) is carried out at the terminals.

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CALL CENTRE

BACKGROUND TO THE INVENTION

The present invention relates to a call centre and to a communications
5 network using such a call centre.

Call centres are widely used by commercial organisations, for the handling
of incoming calls and/or for initiating calls to customers. Typically, a call centre
will have a large number of lines associated with a single number. Calls are
received from customers and held in a queue before being directed to the next
10 available agent. Prior to being placed in the queue the customer may indicate, e.g.
using DTMF tones, the type of call they are making, and they may be placed in a
queue for a specific group of agents depending on the type of call.

It has been recognised that the World Wide Web provides a means for
enhancing communication between customers and a call centre. It has been
15 proposed to enable customers to initiate a call from a call centre via a web page.
For example, WO97/50235 discloses a system in which a customer enters their
phone number on a form in an HTTP page, and then clicks on a "submit" button to
request a call from the call centre.

SUMMARY OF THE INVENTION

20 According to a first aspect of the present invention there is provided a
method of operating a communications system comprising a call centre and a
plurality of customer terminals connected via a communications network to the call
centre, characterised in that at least part of a process of automatic call distribution
(ACD) is carried out at a customer terminal.

25 The term "call centre" as used herein encompasses, as well as
conventional PSTN call centres, call centres which distribute calls using data
protocols such as H323, and hybrid centres handling both PSTN, Voice over IP and
data calls.

The present invention provides a method of operating a call centre which
30 significantly increases the efficiency of use of the capacity of the call centre and of
the associated network. This is achieved by shifting at least part of the process of
automatic call distribution, that is the process whereby a call is assigned to a
particular one of the agents, from the call centre to the customer terminal. Then

instead of lines being tied up with queuing customers, the setting up of a call may be delayed until an agent is available.

Preferably the method comprises

a) communicating ACD (automatic call distribution) data to a customer
5 terminal;

b) using the ACD data selecting at the customer terminal an agent group;
and

c) subsequently establishing a call from a customer terminal via the call
centre to an agent in the group selected in step (b).

10 Automatic call distribution data is data which identifies, explicitly or
implicitly, different groups of call agents, and which in a conventional call centre is
processed at the call centre to allocate the next free agent in a selected group. In
the present invention, this data is used instead at the customer terminal, so that an
agent group, and preferably a specific agent, can be selected prior to the terminal
15 establishing an in-band connection with the call centre.

Preferably the result of the selection made at the customer terminal in step
(b) is communicated to the call centre via the communications network. Preferably
the communications network is a data network supporting a packet-based
internetworking protocol. In the embodiments described below, the data network
20 is the Internet. Preferably the call established in step (c) is also established via the
said data network. Alternatively, the call may be established via another network,
such as the PSTN (public switched telephony network).

Preferably, step (c) is carried out only when the respective agent is free.
Preferably the method includes running a call processing application at the
25 customer terminal and communicating control data for the call processing
application from the call centre to the customer terminal.

Preferably the call established in step (c) is set up from the call centre to
the customer terminal. Preferably a client application running on the customer
terminal returns a network address of the customer terminal on the data network
30 to the call centre, and the call centre establishes a call via the data network to the
said address.

The inventors have found it to be particularly advantageous to have calls
set up via, e.g., the Internet, from the call centre to the customer terminal, using
e.g. the IP address of the customer terminal. The network address will in general

be known to any client application running on the customer terminal, and can therefore be made available to the call centre without requiring intervention by the customer. Moreover, functioning in this manner obviates the need for direct interaction between, e.g., a Java ACD applet on the customer terminal and an internet telephony application on the customer terminal, thereby eliminating interworking problems between these applications.

Preferably the method includes setting up a call between the customer terminal and an agent, storing data identifying the said agent, and automatically directing a subsequent call from the customer terminal to the said agent identified in the said stored data.

This preferred feature of the invention makes it possible to overcome the impersonality experienced by the customer when using a conventional call centre. Whereas conventionally if a customer rings a call centre with an enquiry, and then rings back a short time later, they will be connected to a different agent on each occasion, using the present invention is possible to ensure that when they ring back they are connected to the same agent. This is done by storing data recording the identity of the agent who takes the initial call. This is advantageously done using a cookie, that is a data item in a defined format stored on the customer terminal. This cookie is then automatically returned to the call centre when the customer subsequently accesses the call centre web page.

According to a second aspect of the present invention, there is provided a method of operating a communications system comprising a call centre and a plurality of customer terminals connected via a communications network to the call centre, in which automatic call distribution is carried out before a call is setup.

The present invention also encompasses call centres or customer terminals adapted to operate in accordance with the method of the first aspect.

DESCRIPTION OF THE DRAWINGS

Systems embodying the present invention will now be described in further detail, by way of example only, with reference to the accompanying drawings, in which;

Figure 1 is a schematic of a communications system embodying the invention;

Figure 2 shows the architecture of the principal components of the system of Figure 1;

Figure 3 shows the software objects used to implement the agent session component; and

Figure 4 shows the information flows in a system embodying the invention when an agent is busy;

5 Figure 5 is a diagram showing objects used in implementing the invention;
Figure 6 shows instances of the objects of Figure 5;

Figure 7 shows definitions of the objects of Figures 5 and 6.

DESCRIPTION OF EXAMPLES

As shown in Figure 1, a communications system comprises a call centre 1
10 connected to first and second communications networks 2,3. In this example, the first network 2 is the PSTN (public switched telephony network) and connects the call centre 1 to customer terminals 4 comprising telephones. The second network 3 is the Internet and connects customer terminals 5 comprising, e.g. personal computers which run an internet telephony client such as Microsoft's NetMeeting
15 (Trade Mark). As shown in the Figure, one of the telephones may be co-located with one of the personal computers, e.g. when the customer has two telephone lines used simultaneously for voice and data respectively.

A first platform 101 in the call centre 1, the telephony platform, runs a call centre application. The call centre application uses resources provided by
20 lower level modules including an agent session component (ASC) module and a call management module. The first platform is connected to a second platform 102 which functions as an IP (internet protocol) telephony switch and connects calls from customer terminals to a selected one of a number of agents. Each agent is implemented using a data terminal and a respective internet telephony client.
25 The agents may be located at the call centre or at respective remote sites. A PABX connects calls from the PSTN 2 e.g. using ISDN to the PABX and using a CTI protocol on the interface to the telephony platform. Traffic from the PSTN is packetised and passed to the agents via an H323 gateway and the IP telephony switch. The H323 protocol, which is a well known protocol used e.g. for
30 multimedia conferencing over internet connections, is also used to connect the agents to the IP telephony switch.

The CTI (computer telephony interfaces) in the call centre may be interfaces using both first party and third party call components, as described and claimed in our co-pending British Patent application number 9800803.0 filed

14.1.98, agent's ref. A25559, the contents of which are incorporated herein by reference.

As shown in Figure 2, users of the customer terminals 5 employ a web browser which addresses the call centre using an appropriate URL and downloads e.g. a Java applet which provides a data interface to the agent session component in the telephony platform. ACD (automatic call distribution) data is communicated from the agent session component to the customer terminal via this data interface. The ACD data communicated to the web browser from the call centre may include the identities of a number of agent groups (e.g. "technical", "marketing", "sales") and the status of the corresponding queues. The status information might include, for example, the length of the queue and the expected waiting time in the queue. The agent group identities may be returned as HTTP data and displayed explicitly on the web page. The status data may be returned as variables to the Java applet and are handled appropriately by the applet. Although the status data may be displayed directly on the web page, in a preferred implementation, the status data is used by the Java applet to control the outputting of audio announcements or voice clips.

Optionally, the ACD data may extend to identifying individual agents. For example, a button may be associated with an agent group which, when clicked, displays a list of agent names, together with further buttons for the selection of a particular agent by the customer. Then, when the customer clicks on the "call me" button, their call is only set up when the named agent is free. Alternatively, explicit agent identity data may not be shown to the customer, but when a call is established, the agent identity may be stored, e.g. as a cookie on the customer terminal or alternatively in a cache at the call centre, and a subsequent call within a defined period, e.g. on the same day, may be queued for connection to the same agent.

Although alternatively other client applications may be used to interact with the call centre, for example through the use of a dedicated plug-in client, the use of Java applets is preferred since the applets can run on any Web browser and do not threaten the security of the customer terminal.

The user may initiate a call to the call centre by pressing a "call me" button on the relevant web page. A separate "call me" button may be displayed on the web page for each agent group, or there may be a single call me button on

the page and, e.g., radio buttons beside each agent group to indicate the customer's selection. When the customer clicks on the "call me" button, the Java applet returns the unique IP address of the customer terminal for use by the in later IP telephony calls with the call centre. Even before that button is pressed, the
5 applet may return data to the call centre, e.g. when ever the user's mouse is over the button, or whenever a user first selects the relevant web page. This information may subsequently be used for a telemarketing campaign, calling all users that have shown interest in a particular web site. In this way the call centre is provided with useful statistics in the pre-call phase, before a call has been set
10 up, and this information may be used in controlling the queues to call centre agents, and in other logic functions implemented at the call centre. This information may be presented to agent supervisors along with other agent statistics. For example a display showing numbers of busy agents, free agents, customers held in queues, customers with mice positioned to call and customers
15 looking at the company web page. Such information is of use to systems administrators.

As a customer clicks their mouse over the 'call me' button an applet will request a free agent from the ACD.

When a customer decides to call the call centre instead of making the call
20 immediately, the caller may receive voice clips via the browser simulating an IVR (intelligent voice response) system at the call centre. Since the browser (for example by using CGI scripts and custom pages or by using an applet) is aware of the status of the Call Centre, in terms of queue lengths etc, the voice clips reflect what an IVR system would play in those circumstances if the call to the call centre
25 had already been set up. as previously described the conventional 'press 1 for sales; 2 for marketing; 3.. etc' dialogue is replaced with a GUI (graphic user interface) style options menu with point and click buttons. The caller may be presented with audio and visual images of the product/company while they wait. When an agent is available the call is finally set up. This may occur in either
30 direction. Audio data may be downloaded to the client application when the relevant web page is first visited. This is appropriate, for example, for background music that is to be played to the user as they wait for an agent, and for a ring tone that is to be played to the customer when a call is initiated. Alternatively or in addition, other audio data is downloaded during the initial burst of ring tone as the

call is initiated: this may be more appropriate for 'progress' type announcements. The audio clips may include, e.g, announcements that "you are no. x in the queue", where x is the position of the user in the queue. The applet may trigger the playing of the appropriate voice clip in response to control inputs from the

5 ASC. Other audio or visual information, including menus requiring user input, may be presented to the user via the ASC/IP connection from the call centre both before, during and after the call. By playing audio clips of e.g. a ring tone and subsequent announcements, the application on the customer terminal simulates the existence of a call prior to the call in fact being established.

10 If the Call Centre only makes/receives calls from the internet there is no need for the centre to have a traditional IVR (intelligent voice response) system. There is also no need to have conventional queues of callers waiting to speak to an agent. As is further described below, callers queue before the call is made. If it is wished the caller may be asked if they would prefer to be called back, and if so

15 could specify for example preferred times etc. on a web form. When a call is made, it may be made using internet telephony, or using the PSTN in the case of customers who have two telephone lines.

The implementation shown in Figure 2 includes the following components:

ACDi	Automatic Call Distribution Intelligence
ASC	Agent Session Component
JTAPI	Java Telephony Application Programming Interface
NM	NetMeeting
NMCC	NetMeetingCallComponent.

The relationship between the principle components, ACDi, Agent Session

20 (ASC) and Agent Group is illustrated, using OOD (object oriented design) conventions in Figure 5. Figure 6 shows how these classes are instantiated during a particular session and Figures 7a to 7b show definitions of these classes. The ACDi object acts as the centre of control and maintains lists of all AgentSession and ACDGroup objects. It exports a CORBA interface to allow administration and

25 utilisation of functionality. The Automatic Call Distribution Group (ACDGroup) represents a call group within the call centre. As such, it allows agents to become members and thereby service call requests applicable to that group. For example different groups might relate to sales or to technical support. Each ACDGroup

maintains a list of registered AgentSession objects, representing agents that are members of that group. The AgentSession object represents an agent logged into the call centre. AgentSession objects are created when an agent logs in and removed when that agent logs out, giving the object a lifetime that corresponds to the log-in status of an agent. Each AgentSession object maintains a list of ACDGroup objects of which it is registered as a member.

In the example shown in Figure 6, an agent, called Dave, is logged into the system and has an AgentSession object that represents him. Dave is registered as a member of the Marketing and Sales ACD Groups.

10 The ASC ascertains the availability of agents. It receives asynchronous notification when an agent's availability alters. As described above, the web user can initiate a call or receive a call back from an agent in appropriate call group. For example the customer may choose from groups corresponding to sales, order handling and invoicing. This menu of choices may be displayed to the user on the call centre web page. An applet, termed the "ASCENT" applet, at the customer terminal reflects the call request state visually and presents business specific information whilst waiting for a call to be established by a free agent making a return call to the user. The ASCENT applet may communicate with the local IP telephony, e.g. Net Meeting, client. The applet may reflect the call request state audibly by playing, e.g. ringing tones and status messages. In this way the applet simulates a call to the call centre, although the call only becomes a reality when an agent is free. In this way the invention reduces the media stream bandwidth into the call centre since the calls are not queued into the centre awaiting a free agent. Call centre speech processing and dialogue handling is moved to the client machine, reducing the cost to the call centre owner.

A software design implementing the invention will now be described in further details. The availability of agents registered with the application is made known to the ASC via the addition of an AvailabilityObserver on application. When an agent's availability alters, the method *availabilityChanged(...)* is invoked against the AvailabilityObserver to notify the ASC and the ACD Intelligence (ACDi)

The ASC may have access into the application via CORBA, whereby methods can be invoked across the network against remote objects. The application when used to implement the invention provides the methods specified below:

- boolean addAvailabilityObserver(AvailabilityObserver ao)

Allow the ASC to add an observer to the application in order to receive asynchronous notification of agents' availability changes.

- `boolean removeAvailabilityObserver(AvailabilityObserver ao)`

Allow the ASC to remove the observer previously added.

- 5 • `Agents[] getAgents()`

Allow the ASC to obtain a list of agents currently logged into application, including their availability and ACD groups.

- `String[] getACDGroups()`

10 Allow the ASC to obtain a list of the available ACD groups within the application.

- `boolean makeCall(Agent agent, String nmIP)`

Allow the ASC to initiate a call, on behalf of the specified agent, to the specified NetMeeting IP address.

15 Agent Session Component (ASC)

The Agent Session Component (ASC) provides an API (application programmers interface) consisting of case-insensitive text-based messages. These are passed via a socket connection between the ASC and each Call Applet. The messages are listed below. Angled brackets denote parameters appropriate to the
20 specified command.

Call Applet to ASC

- `[register, <nmIP>]`

25 Used to register the Call Applet with the ASC, passing it the IP address of the machine on which the applet is running, subsequently used in all communication to unambiguously identify itself.

- `[deregister, <nmIP>]`

Used to deregister the Call Applet with the ASC.

- `[callrequest, <nmIP>, <ACD group>]`

30 Used when the Call Applet wishes to receive a call from an agent in the specified ACD group.

- `[getacinfo, <nmIP>]`

Returns the current state of the ACD groups, number of agents, busy/free status etc.

ASC to Call Applet

- [requestqueued, <etunc>]

5 Used when the intended agent that will handle a specific call is busy, but will be free after an *estimated time until return call* <etunc> seconds.

- [freeagent]

Sent when an appropriate agent's state has changed to free.

A scenario using the above design will now be described with reference to
10 Figure 4. The numbers in this description denote the steps shown in that Figure.

On the telephony platform the ASC, ACDi, and JTAPI are running. The ASC initialises by adding an AvailabilityObserver to the ACDi (1), and then obtains a list of agents currently registered (2). Whilst browsing the WWW, the Web User enters a URL that points to a HTML page containing the Java ASCENT
15 applet. During initialisation, the ASCENT applet registers itself with the ASC (3), and proceeds to obtain a list of ACD groups and associated agents' states (4). This information is presented via a Graphical User Interface (GUI) and the Web User is to select an ACD group with which to place a call request.

It the scenario illustrated in Figure 4, the ACD group with which the Web
20 User has elected to place a call has no agents available at that time. The call request is queued at the ASC and a message is sent to the applet to that end, along with an *estimated time until return call* (etunc) (6). At this point, intelligence in-built in the applet deals with the situation and by playing audio status messages and giving visual information such as company history and product information.
25 Via the AvailabilityObserver, a availabilityChanged() invocation is received by the ASC to indicate that an agent's state has changed (7). The agent that has become available is part of the ACD group that the applet placed a call request with and so the applet is informed that an agent is now free (8). The ASC then makes a call on the free agent's behalf (9), which subsequently initiates an IP
30 telephony call using JTAPI (Java Telephony Application Programmers Interface) (10).

CLAIMS

- 5 1. A method of operating a communications system comprising a call centre and a plurality of customer terminals connected via a communications network to the call centre, in which at least part of a process of automatic call distribution (ACD) is carried out at a customer terminal.
- 10 2. A method according to claim 1, comprising
- a) communicating automatic call distribution (ACD) data to a customer terminal;
 - b) using the ACD data selecting at the customer terminal an agent group and/or an agent; and
 - 15 c) subsequently establishing a call between a customer terminal and an agent in the group selected in step (b) via the call centre.
3. A method according to claim 1 or 2, in which the communications network is a data network supporting a packet-based internetworking protocol
- 20 4. A method according to claim 1 or 2 or 3, in which the result of the selection made at the customer terminal in step (b) is communicated to the call centre via the communications network
- 25 5. A method according to claim 4, in which the call established in step (c) is also established via the said data network
6. A method according to any one of the preceding claims, in which a call is established between a customer terminal and the call centre only when an agent
- 30 selected by the automatic call distribution process is free.
7. A method according to any one of the preceding claims, in which when the call is established the call is setup from the call centre to the customer terminal.

8. A method according to claim 7, when dependent directly or indirectly on claim 3, in which a client application running on the customer terminal returns a network address of the customer terminal on the data network to the call centre, and the call centre establishes a call via the data network to the said address.
- 5
9. A method of operating a communications system comprising a call centre and a plurality of customer terminals connected via a communications network to the call centre, in which automatic call distribution is carried out before a call is setup.
- 10 10. A method according to any one of the preceding claims, including transmitting pre-call-phase data from a customer terminal via a data channel prior to a call being established between the customer terminal and the call centre. .
- 15 11. A method of operating a communications system comprising a call centre and a plurality of customer terminals connected via a communications network to the call centre, in which pre-call-phase data is transmitted from customer terminals to the call centre via a data channel prior to a call being set up between a respective customer terminal and the call centre.
- 20 12. A method according to claim 10 or 11, in which the said pre-call-phase data is automatically returned to the call centre in response to the selection by the customer of a web page.
- 25 13. A method according to any one of claims 10 to 12, in which the said pre-call-phase data is returned to the call centre in response to the presence of a user-controlled pointer in a predetermined region of a graphical display generated by a client application on the customer terminal.
- 30 14. A method according to claim 13, in which the said predetermined region is a button, that, when selected, requests initiation of a call.
15. A method according to anyone of the preceding claims, including outputting at the customer terminal audio announcements received as data from the call

centre, the outputting of the audio announcements at the customer terminal being triggered in response to one or more of:

- a) status data received from the call centre; and
- b) user inputs registered at the customer terminal.

5

16. A method according to claim 15, including simulating at the customer terminal, using the said audio announcements, the establishment of a call between the customer terminal and the call centre, prior to the call being in fact established.

10

17. A method according to anyone of the preceding claims, including communicating a client application from the call centre to the customer terminal, and in which the client application captures and returns to the call centre a network address of the customer terminal.

15

18. A method according to claim 17, in which the client application is a Java applet.

20

19. A method according to any one of the preceding claims, in which the ACD data communicated to the customer terminal includes data identifying individual agents.

25

20. A method according to any one of the preceding claims, including setting up a call between the customer terminal and an agent, storing data identifying the said agent, and automatically directing a subsequent call from the customer terminal to the said agent identified in the said stored data.

30

21. A method according to claim 20, in which the said data is stored at the customer terminal.

22. A method according to claim 22, in which the said data is stored as a cookie, and in which the said data is returned automatically to an ACD application when the customer terminal subsequently accesses the call centre web .

23. A call centre for use in a method according to any one of the preceding claims, the call centre including;

- a) a network interface for connection to a communications network;
- 5 b) a data output arranged to output automatic call distribution (ACD) data via the network interface;
- c) means responsive to a selection made by a user in response to the said ACD data for setting up a call between a customer terminal and a selected agent.

10 24. A customer terminal for use in a method according to any one of the preceding claims, the customer terminal including;

- a) a network interface for connection to a communications network;
- b) a client application arranged to register a user selection of an agent in response to ACD data received via the network interface;
- 15 c) output means arranged to output selection data via the network interface, in use the selection data being received at a call centre.

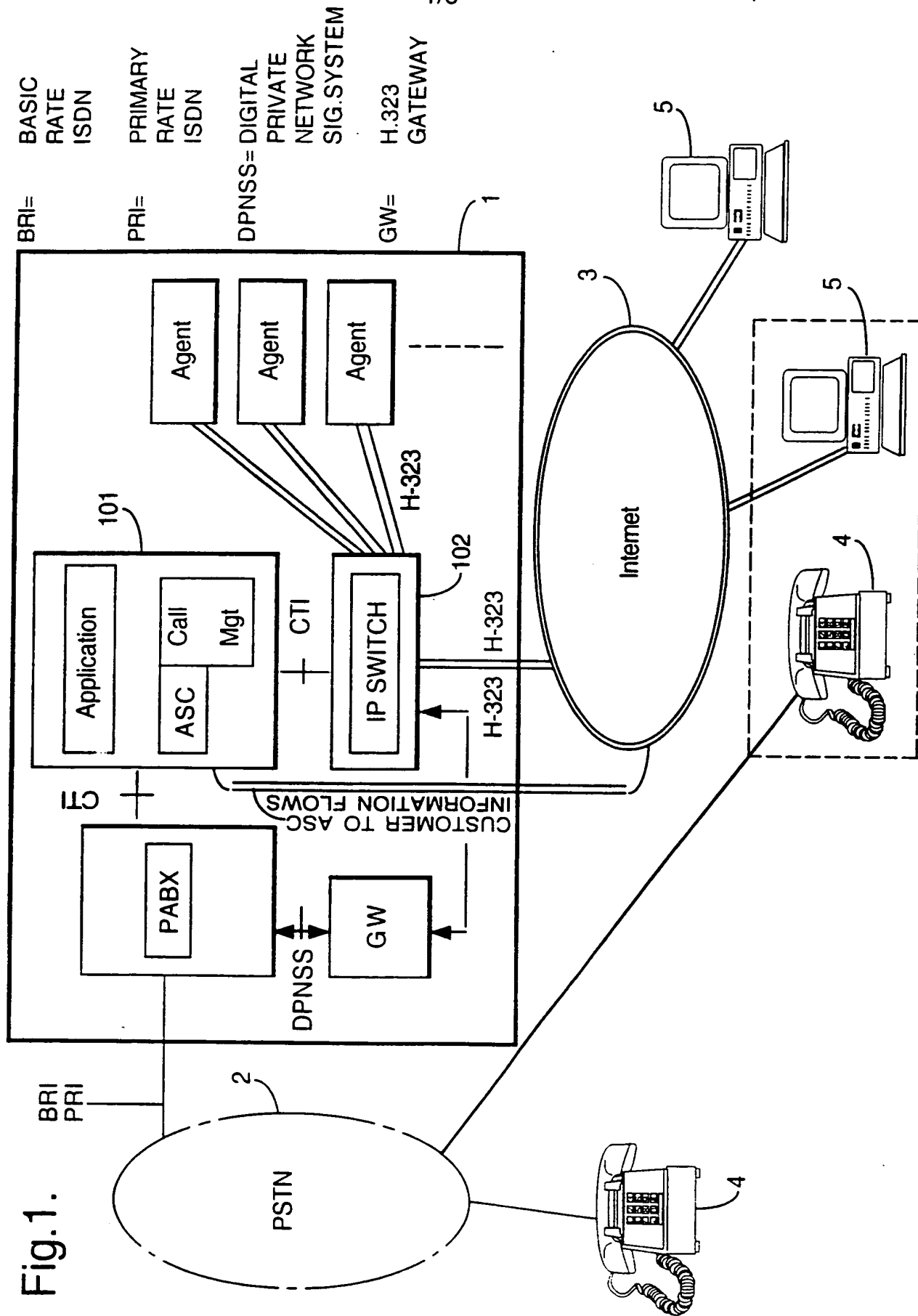


Fig.2.

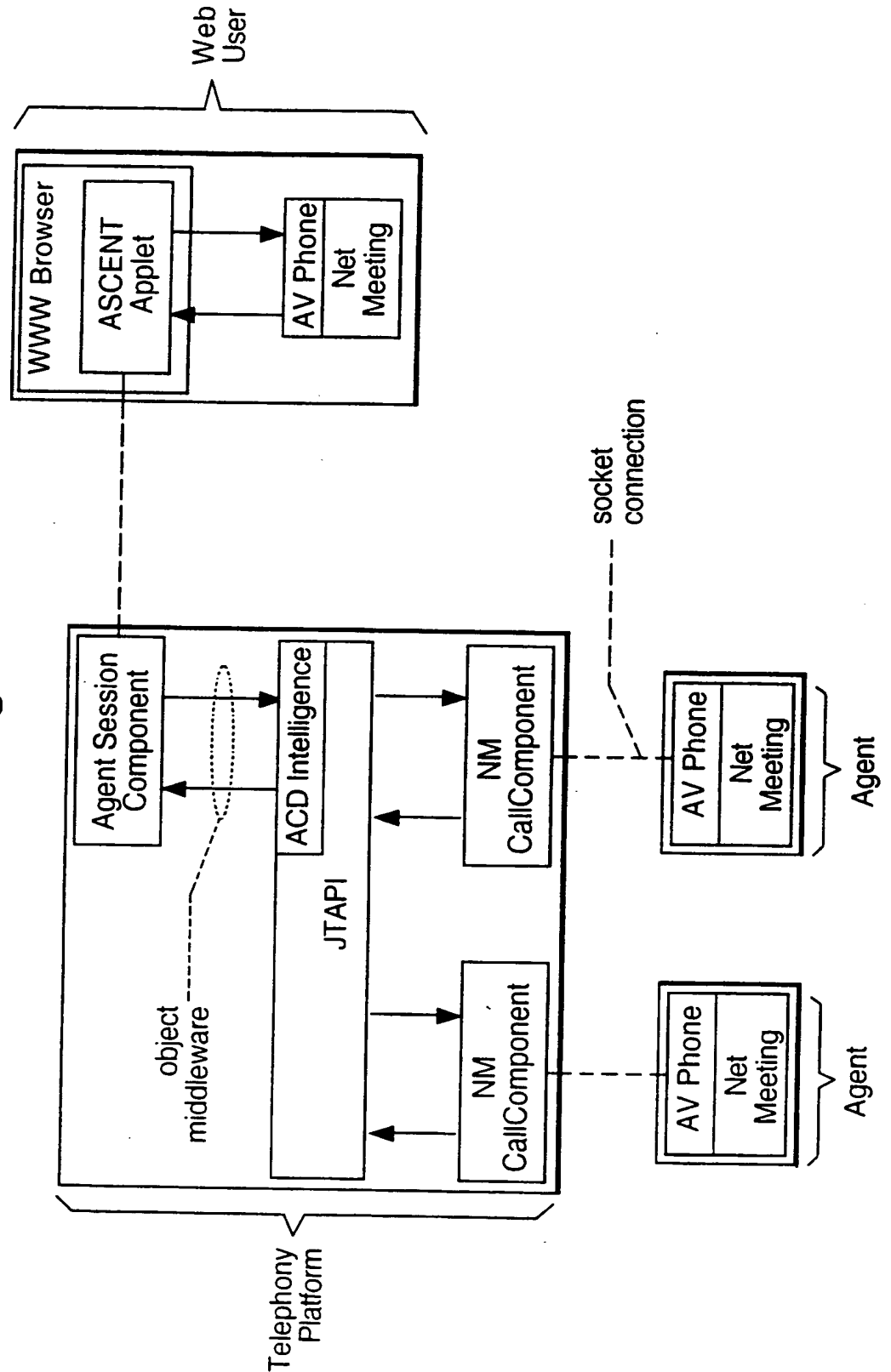
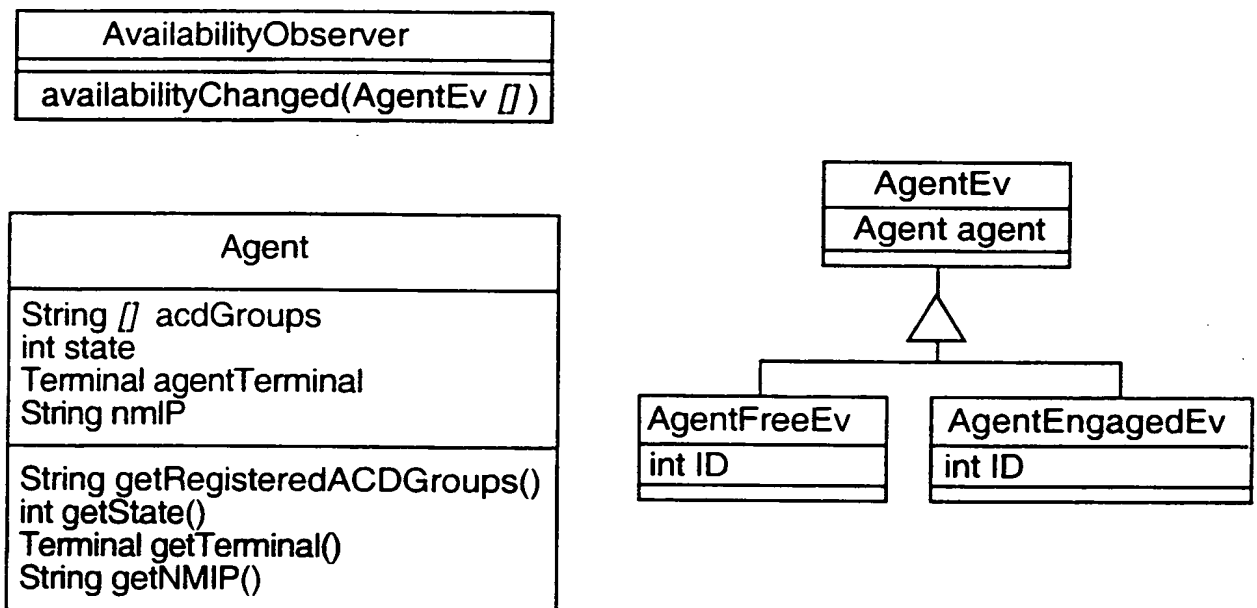


Fig.3.



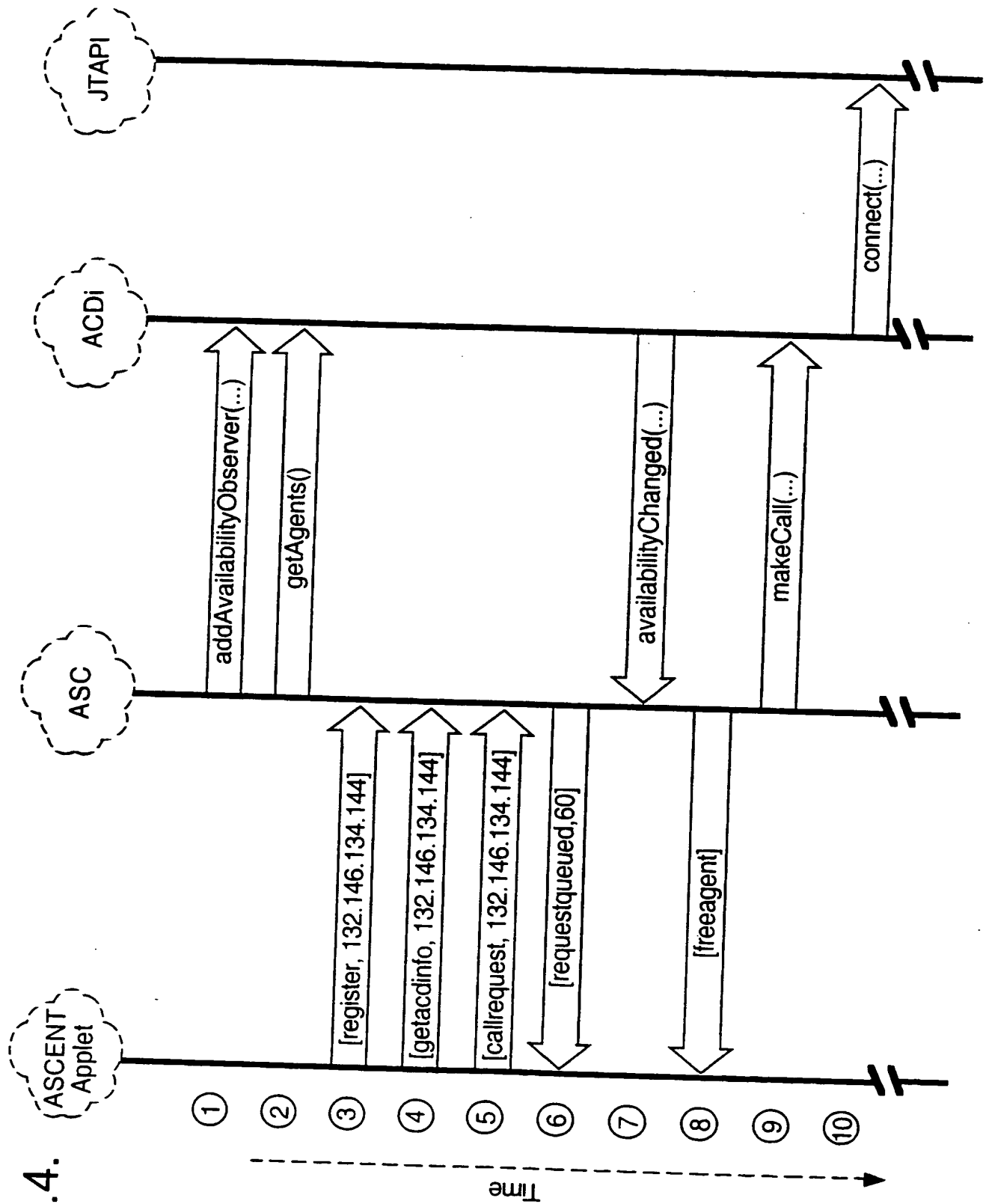


Fig.4.

5/6

Fig.5.

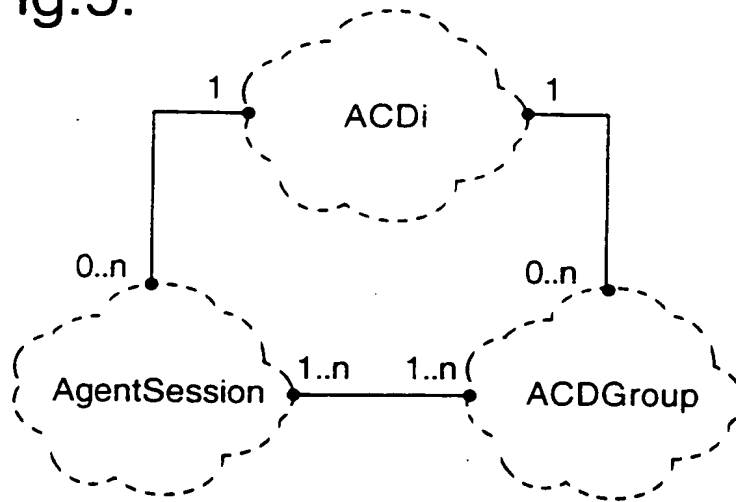
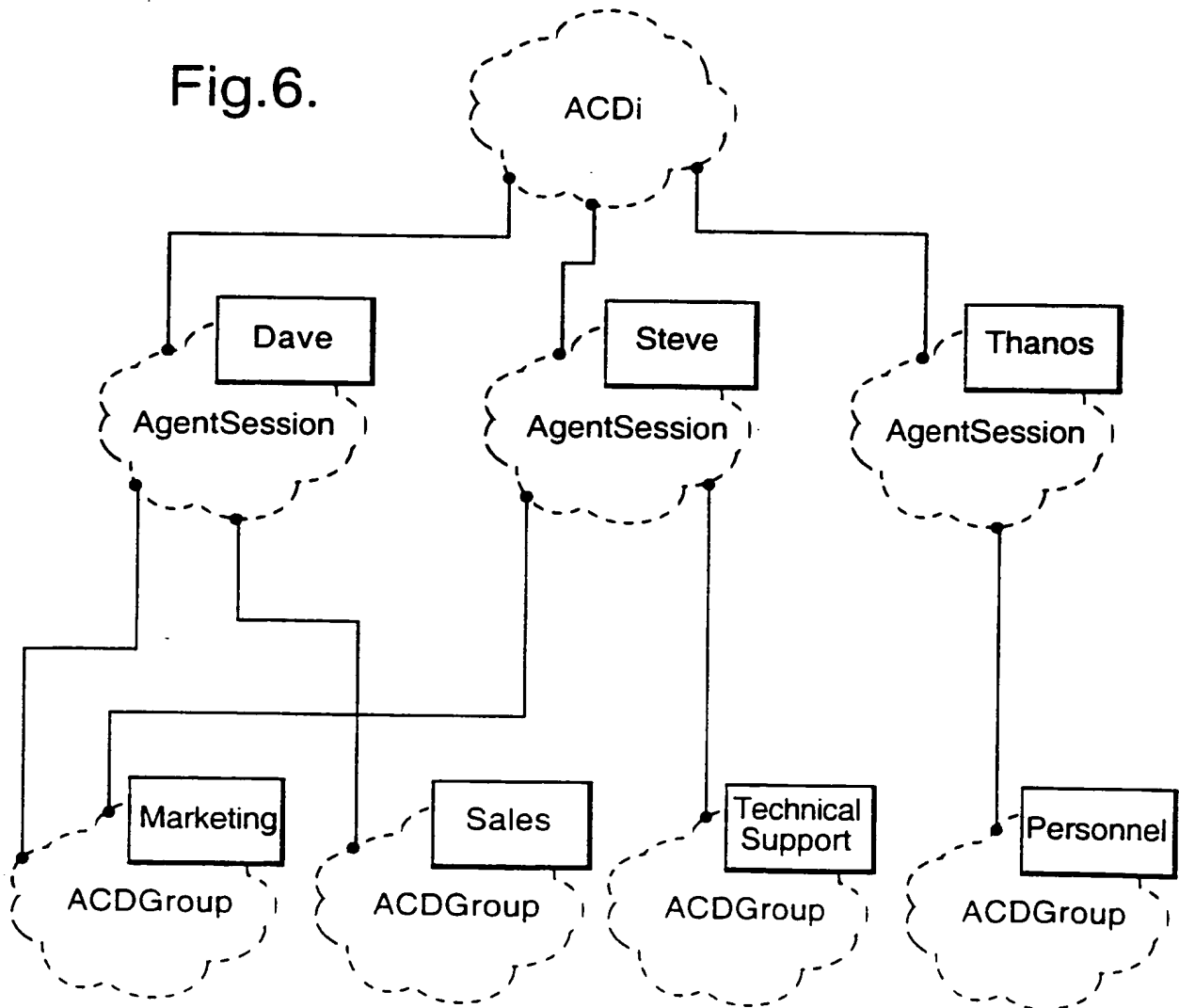


Fig.6.



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Fig.7a.

ACDi
Vector agentSessions Vector acdGroups
int addCallRequest(String groupName) AgentSession createAgentSession(String uid, String address) boolean deleteAgentSession(String uid) AgentSession getAgentSession(String uid) int getAgentSessionCount() AgentSession[] getAgentSessions() int getFreeAgentSessionCount() AgentSession[] getFreeAgentSessions() String[] getGroups() boolean removeCallRequest(String group name)

Fig.7b.

AgentSession
String address String uid
int addMembership(String groupName) String[] getMembership() String getUID() void removeAll() boolean removeMembership(String groupName) String setUID(String uid)

Fig.7c.

ACDGroup
Vector callQ Vector agentSessions
boolean add(String uid) int addCallRequest(int id) boolean freeAgentCallback(String uid) int getAgentSessionCount() Agent[] getAgentSessions() int getFreeAgentSessionCount() boolean remove(String uid) boolean removeCallRequest(int id)

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/00057

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H04M3/50 H04M7/00 H04L29/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04M H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 50235 A (NORTHERN TELECOM LTD ;SULLIVAN MARCUS O (IE); MCGUIRE THOMAS STEPH) 31 December 1997 cited in the application see page 2, line 15 - page 5, line 2 ---	1,3,6-11
X	LAUTENBACHER M E ET AL: "INTELLIGENT INTERNET: VALUE-ADDED SERVICES BY INTERWORKING BETWEEN NETWORK TECHNOLOGIES" ISS '97. WORLD TELECOMMUNICATIONS CONGRESS. (INTERNATIONAL SWITCHIN SYMPOSIUM), GLOBAL NETWORK EVOLUTION: CONVERGENCE OR COLLISION? TORONTO, SEPT. 21 - 26, 1997, vol. VOL. 2, 21 September 1997, pages 45-51, XP000704454 ABDALLAH ABI-AAD ET AL see paragraph 3.1 --- -/--	1,3,6-11

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"Z" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Intern al Application No

PCT/GB 99/00057

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 740 445 A (ROCKWELL INTERNATIONAL CORP) 30 October 1996 see abstract ----	1,3,6-11
A	WO 97 28635 A (GENESYS TELECOMMUNICATIONS LAB) 7 August 1997 ----	
P,X	WO 98 20667 A (TELOQUENT COMMUNICATIONS CORP) 14 May 1998 see page 1, line 14 - page 4, line 13 -----	1-11